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Figured on the basis of miles-per-hour to cubic inch capacity the result of this race proves that the winner had but four-sevenths of the effectiveness of the Wright-powered Thomas-Morse entry.

Again in one of the other classes, the Navy entry (a Vought) powered with a Wright Model E motor of 718 cubic inch capacity succeeded in establishing a speed of 143 miles per hour, or at the rate of .1975 miles per hour per cubic inch displacement, while the larger planes, from which the Vought won, obtained but .0862 miles per hour per cubic inch displacement. One of the most remarkable showings made in aeronautical engine design.

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AVIATION
AND
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Sane Flying and Public Opinion

THE last few months have witnessed the formation of a definite attitude among the lay public concerning stunt flying. There have been several accidents due entirely to recklessness on the part of the pilot and in almost every case the public, as represented by the daily papers, has unanimously condemned the practice. Flying low over cities or public gatherings should be included in the term stunt flying. Some communities have gone to the extreme of passing ordinances prohibiting. low flying, etc. This is a good move in theory but such regulation should be left to the federal government as the laws for aviation should be universal all over the country.

Many pilots state that after a certain amount of time in the air, straight flying becomes intensely monotonous and unless they stunt they do not enjoy flying. This is undoubtedly a fact but it is not necessary to stunt below 1500 ft. to enjoy it. Hedge-hoping is perhaps the greatest thrill that can come to an airman but it derives its sensation from the practical certainty of a crash in the event of engine failure. If the pilot were the only one to suffer it would be bad enough, but this form of light diversion is usually indulged in where the machine would go through a house or land in a street in the event of a crash and hence is liable to injure the "innocent bystander."

Stunt flying is absolutely inimical to the progress of commercial aviation. It has been said that the future commercial machine will probably be practically unable to stunt as a large degree of inherent stability will be incorporated in its design. It is a certainty that stunt flying has no part in flying with a pay load from one point to another.

There is one form of stunt flying that seems to have found a place with dare devil automobile and bicycle stunts and that is aerial acrobatics, such as changing from one plane to another in flight. Such exhibitions are becoming a fixture at country fairs and if properly managed the only person in danger is the performer himself. The public will always pay to see someone else risk his life. But the pubilicity attending accidents from this form of flying does great harm.

The Rising Tide

ONE of the most hopeful signs of the times for aviation is the enthusiasm displayed on both sides of the continent at the two recent air races. While the majority of the crowd undoubtedly turned out to see an exciting and, to them, novel race, they had a great interest in the types of machines on view. This is especially true of the Pulitzer Race when everyone displayed a great deal of interest in the various Army and Navy types.

As both the Pulitzer and the California Air Tournament were concluded without injury to pilots, the lay public is more inclined to believe that the airplane is not the most dangerous vehicle ever invented. The comparison between the dangers of automobile racing with driving a pleasure car on the road is unconsciously taken into account when watching an airplane race. The comparison is a fair one as the airplanes are specially constructed and the flying is done near the ground which increases the risk in the event of a forced landing.

The increasing interest of the public in aviation during the present period lacking as it is in aircraft is bound to be a big factor on aeronautical progress. When the public is educated to demand the aerial transport of passengers, mail and express, operators will be easily found to supply the demand.

Aircraft Communications.

COMMUNICATION with airplanes throughout a flight is rapidly becoming a well-established fact. This is principally due to the fact that coast radio and compass stations are giving more time and attention to working with planes during flights. Recent results are encouraging to the aircraft operators, who now find that their calls no longer go ignored, as was the case six months ago. This improvement has made aircraft operators anxious to make flights whenever the opportunity comes, and has added much interest to the work which so long brought no results. There must necessarily be much improvement over the present methods.

The principal handicap at present is the low sending wave length of aircraft, making it difficult for shore stations to receive. This condition is being remedied by the use of longer waves in aircraft sets. Old sets are being altered and new ones installed in all aircraft, and it is expected that within a few months all aircraft will be able to transmit on 507, 600, 800, and 975 meters. Continued cooperation of the shore stations will then make flight communication simpler, more satisfactory, and nearer the desired methods.

During recent Pacific coast flights from San Diego successful communication has been carried on from Navy planes to shore stations, compass stations also taking bearings of all planes.

A Three Plane Navy

THE suggestion that the naval power of the future will have to be exerted in three planes, under water, on the surface and in the air brings with it many interesting possibilities. The expenditures required for the adequate preparation for naval air warfare will be necessarily out of proportion to the other two planes owing to the high state of development that they have attained. To quote the New York *Tribune* on this subject:

War overseas—that is, between nations separated by the Atlantic or the Pacific—can be waged only by navies hereafter. This fact necessarily emphasizes the importance of navies.

Sea power becomes more important than ever. But we must keep constantly in mind the further fact that sea power today depends largely upon submarine power and air power. A surface navy alone will not suffice. *A three-plane navy is forced upon us.* At present it is imperative to spend our money largely upon the upper and lower planes—for aviation and submarines.

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PROPERTY U. S. AIR FORCE

U. S. Naval Aircraft Construction-1920

The Bureau of Construction and Repair of the Navy Department has made great progress during 1920 and Naval Aviation at present is going through a change of mission entailing the development of entirely new types of aircraft suitable for overseas work with the fleet. The war-time flying boats developed for submarine patrol must be supplemented by ship planes, torpedo planes, etc., to go overseas with and as part of the fleet. Also, the non-rigid airships designed during the War are to be supplemented by rigid airships of the Zeppelin type for overseas reconnaissance in cooperation with Naval vessels.

Consequently, the greater part of the funds and personnel of the Aircraft Division of the Bureau of Construction and Repair have been devoted to experimentation and research both practical and theoretical. The new types of aircraft required have led into new fields of design and construction, notably: metallurgy of light alloys and alloy steels, new aerodynamic problems, model basin research on new float forms, the theory of indeterminate structures, gas tight films, improved textiles, fire proofing, corrosion problems, catapults, metal construction of wings and airships involving new fabricating processes, etc.

The Bureau personnel and facilities devoted to this work is much restricted by the limitations of the L.E.J. bill and, unassisted, could not expect to cope with more than a superficial examination of the problem. However, by a judicious allotment of funds to other government departments provided with special research laboratories, by cooperation with scientific societies and manufacturers, and by making contracts for experimental apparatus and material with inventors, the ideas of a large group of experts become available for application. In this way, it is believed that substantial progress in development has been and can be maintained so long as funds are liberally supplied.

Coordinating Facilities

The following naval, governmental and professional facilities have been used in the work of the year:

Aircraft Division, Bureau of Construction and Repair; Aerodynamic Laboratory (two wind tunnels Washington Navy Yard); Experimental Model Basin, Washington Navy Yard; Naval Aircraft Factory, Philadelphia Navy Yard (experimental construction); Naval Air Station, Hampton Roads, (experimental flying); Naval Air Station, Pensacola (experimental flying); H. A. Gardner, Institute of Industrial Research, (consulting chemist); Prof. Wm. Hovgaard, Massachusetts Institute of Technology (consulting engineer, rigid airships); U. S. Bureau of Standards (allotment of $30,000 to cover research and testing in chemical, metallurgical, mechanical, and textile departments); Forest Products Laboratory of the Department of Agriculture, Madison, Wis. ($40,000 allotment to cover research on woods, glues, veneers and protective coatings, and experimental construction); National Advisory Committee for Aeronautics ($5,000 allotment for special technical research and information); Engineering Division, Air Service, McCook Field, Dayton, Ohio; Society of Automotive Engineers; American Society for Testing Materials.

Contracts for experimental aircraft are now outstanding with ten firms, and six firms have taken on various phases of the development of suitable light and high strength alloys for metal aircraft construction. Improved types of wire and cable are being worked on by three firms and ten firms are engaged on work in connection with new textiles and their proofing by rubber, varnish, cellulose, etc., for protection from the weather or for gas tightness.

Experimental parachutes of different types have been purchased for trial from four concerns and thirteen firms are under contract for various experimental instruments and articles of equipment.

Aerodynamic Research

The Aerodynamic Laboratory at the Washington Navy Yard is engaged in wind tunnel experiments to predict the efficiency, balance and stability of aircraft designed by the Bureau or by contractors. Besides this routine testing, research of a more general nature is being prosecuted in a systematic manner to develop improved wing forms, control devices, airship shapes, etc.

During the year, an improved aerodynamic balance has been designed and constructed which measures the three forces and three moments imposed by the wind on a model airplane.

The delicate weighing of the forces, which normally requires a highly trained operator to adjust for exact balance, is now done instantaneously and automatically by tiny electric motors. The capacity of the laboratory has, therefore, been increased by this invention more than by the addition of several new wind tunnels.

Among the useful results recently obtained from the wind tunnel may be listed: Determination of relative resistance of British and American airship forms; Determination of effect of airship form on directional stability; Aerodynamic properties of certain aero bombs; Stability coefficients for "C" class airship; Stability coefficients for NC flying boat; Aerodynamic properties of a series of German high lift wings; Aerodynamic properties of devices to increase the lift or speed range of wings; Aerodynamic properties and stability predictions for "Giant" flying boat; More exact knowledge of the action of ailerons and control surfaces; Exploration of flow of air over the deck of a model of the airplane carrier *Langley*.

Model Basin Research

The staff and equipment of the Experimental Model Basin at the Washington Navy Yard, normally engaged in problems relating to the propulsion of ships have been used to great advantage in predicating the planing properties of seaplane floats and hulls. The lines of the NC flying boats were developed from towing tests in the tank and at the present time no flying boat or seaplane is built until the design is proved by tests in the tank. Such tests have given a good prediction of what may be expected from the design.

A new class of problem has come in with the demand for aircraft to go aboard ship. This is the amphibian, fitted with a boat or floats and wheels as well. The presence of wheels, if allowed to drag in the water, has a very bad effect on the planing of the boat.

An illustration of the use made of the model tank is a research now under way in which a series of twelve NC flying boat hulls is being tested, each one differing in some particular from another and from the original NC type. Such an exhaustive experiment, if conducted full scale, would cost several hundred thousand dollars.

Other problems in hand at the tank are means for carrying torpedoes inside boat hulls, reduction of spray thrown into the propeller, and an investigation of the wave motion caused by a flying boat. This latter study is being made with an ultra-rapid motion picture camera.

Research in Woods

The Bureau does not maintain facilities for research in wood technology, but arranges to have its problems studied by the Forest Products Laboratory. This work includes study of the strength, storage, preservation and heat treatment of American woods; strength of glues, plywoods, splices, and proposed methods of construction; fungus and rot, weathering, water proofing, etc.; mechanical tests for strength of new types of wooden beams, struts, and panels in connection with new airplane designs.

During the year, the F.P.L. waterproof casein glue has been rendered fungus resisting by adding suitable poisons in the formulae.

Madison has developed an improved form of wing rib and a method of testing wing ribs in the factory as well as a standard proof test for struts. The work on plywood has led to valuable data on the use of special plywoods and their fastening and application to replace fabric as wing covering. Sample plywood covered wings are now being tested under service conditions.

The mechanical tests are bringing out important conclusions for use of designers bearing on the effect of rate of loading on strength of wood, form factors in combined loading of wing beams and the influence of fillets and routing on the strength of wooden members.

Technical Research

The expert technical staff and splendidly equipped laboratories of the Bureau of Standards are used to such an extent that it has proved unnecessary for the Navy to duplicate such equipment.

The chemical department is made use of for testing anti-corrosive coatings for metal parts, waterproof varnishes and enamels for wood, rubberized fabrics for balloons, doped fabrics for airplanes, goldbeater's skin for rigid airships, and in general all sorts of protective coatings and hydrogen tight films.

The metallurgical department is being used in connection with the development of special light alloys and alloy steels for use in metal construction of airships and airplanes.

The mechanical department is now engaged in an investigation of the strength and fatigue properties of duralumin, the alloy used for rigid airships. This is a comprehensive investigation financed by the Bureau of Construction and Repair and coordinated with other research by the Army Air Service under the direction of the National Advisory Committee for Aeronautics.

The Bureau of Standards is also developing several special precision instruments to be carried in airplanes on trial flights. The need for such instruments comes from the necessity to analyze more carefully the peculiar behavior of certain machines. It is hoped that a very superior equipment will become available from this work.

Exposure tests on coated fabrics have led to the adoption of processes for treating airplanes and balloon fabrics which show a marked improvement in life over anything known during the war.

The Bureau is in very close touch with the National Advisory Committee for Aeronautics through membership of the Chief Constructor on the committee supplemented by membership of other officers and employes of the Bureau on the technical sub-committees which coordinate the areonautical research work of the country.

Several of the Bureau's more difficult technical problems have been put up to the sub-committees for solution and useful results are being obtained. In particular, the case of accelerations in an airplane when "stunting" have been investigated with recording instruments and it is now possible to say with some assurance whether such "stunting" is beyond the structural strength of a given airplane. The committee has also determined for the Bureau the pressures experienced by the tail surfaces of an airplane in flight. This has always been a difficult point and designers were uncertain of the actual effects to be allowed for.

The Committee's European connections have proved most valuable to the Bureau in keeping Naval designers and constructors informed of new developments abroad.

Cooperation with Army

The Airplane Engineering Division of the Army Air Service at McCook Field, Dayton, Ohio, is a center of a research and experiment for the Army. A naval officer is constantly on duty there to keep the Navy Department informed of progress made toward the solution of problems of interest to the Navy, and in addition a design man is sent from the Bureau of Construction and Repair to McCook Field at frequent intervals to witness important tests and to confer with Army designers.

As a result of such cooperation, the Army type of parachute developed at McCook Field has been adopted as standard by the Navy and several types of airplanes developed by the Army have been adopted by the Navy for modification for Naval purposes.

Aeronautical Board

The Aeronautical Board coordinates Army and Navy activities in general to prevent duplication and to this extent a considerable number of problems are submitted to this Board for decision as to the best means to attack them in the interest of both services. The Aeronautical Board has a technical committee to pass on such matters on which this Bureau is represented by two officers.

As an example of how this Board functions, it may be recalled that the development of rigid airships in this country has been placed in the hands of the Navy until firmly established.

Naval Aircraft Factory

The Naval Aircraft Factory at the Philadelphia Navy Yard is used to manufacture and develop new types of aircraft, new devices and equipment for aircraft, new methods of construction, and to experiment with the fabrication of new materials. For example, the new waterproof glue of the Forest Products Laboratory is sent to the Naval Aircraft Factory to perfect the shop practice involved in its use. New processes are first brought out on a laboratory scale and have to be tried in an actual shop to prove their worth.

The Naval Aircraft Factory is now working on the construction of girders and other parts of duralumin for rigid airship ZR-1, and two new cars and experimental fins and rudders for non-rigid airships. Two types of land airplanes are being converted to seaplanes and also other units of the same type fitted with flotation gear and a machine gun installation. Two types of experimental flying boats are under construction as well as gliders for anti-aircraft gun targets, wings of new profile to go on a standard type plane, folding wings, experimental metal wings, variable camber wings, arresting devices for shipboard landing, and a miscellaneous list of experiments involving minor changes in existing aircraft.

As an example of the nature of one class of experimental work done at Philadelphia, the case of the standard Navy F-5 flying boat is a good illustration. A series of F-5 boats drawn from store has been altered in an effort to determine possible improvements as follows:

One boat fitted with folding wings.
One boat fitted with tandem Liberty engines.
One boat fitted with streamline wires.
One boat fitted with new type of bottom.
One boat fitted with fireproof wings.
One boat fitted with a well for a mapping camera.

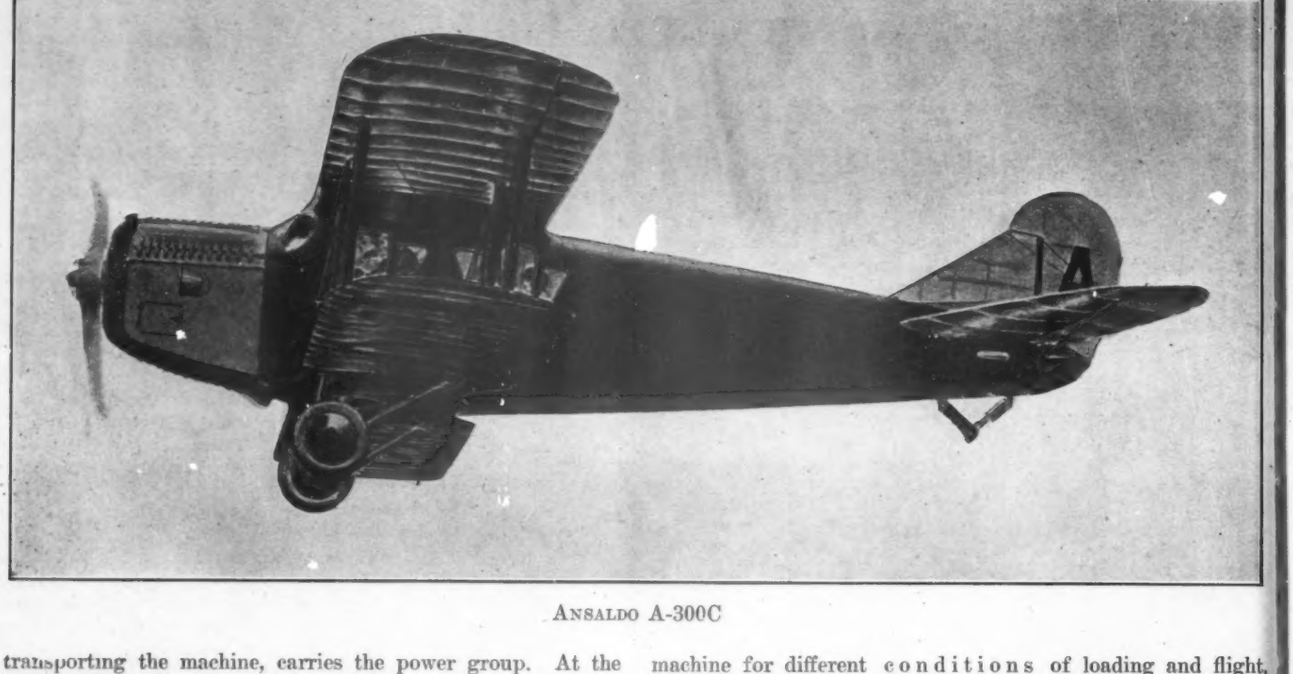
These experimental boats are launched from the Factory directly into the Delaware River for practical demonstration of the new feature incorporated. The location of the constructing plant is especially favorable for rapid and economical manufacture in the heart of an excellent labor and material market as well as for flight tests on the river.

The Ansaldo A-300C

The test of a new type of airplane for civil aviation has been carried out at the flying field of the Ansaldo Co., Turin, Italy. The tests have given very good results. The aviator Mario Stoppani, well known in Italy and abroad for his exploits during the war and in civil aviation since, was the pilot in these tests.

The airplane A-300C is a single engine, central fuselage biplane. It was specially constructed for the transport of passengers and its design is essentially different from the war designs. The power of the machine is very much reduced if the useful load which it is able to carry is considered; but its good aerodynamic properties and its general characteristics give it a large radius of action and make an ideal transport airplane. The passengers and the operating personnel are provided with perfect comfort. The effort necessary to operate and maintain this machine is very limited.

The frame work of the fuselage can be constructed either of wood or steel tubing; the factor of safety is greater than one. The forward part of the fuselage, which in the metal model is demountable to facilitate changing engines and



ANSALDO A-300C

transporting the machine, carries the power group. At the rear of the engine is located a cabin for the pilot and the mechanic. A second cabin behind that is arranged for four passengers who are not crowded. The cabins for the pilot and the passengers are completely enclosed and are entered by a side door. The windows in the sides are disposed to give good visibility an attraction for passengers.

The wings are attached to center sections growing out of the fuselage. These center sections are braced by steel tubing. All four wings have ailerons. The landing gear is attached to the lower center section by two pairs of metal struts forming V's. The axle fairing is in a form of a small wing.

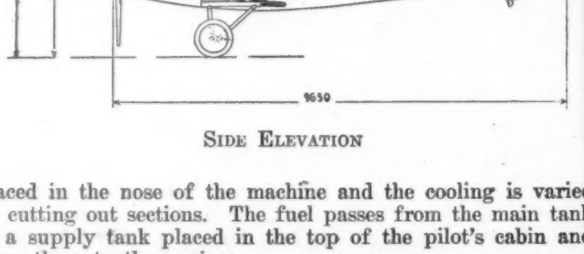
The rudder is balanced and the incidence of the tail plane can be varied in flight. The pilot is thus able to adjust the machine for different conditions of loading and flight.

Nothing has been left out that would assure the comfort of the passengers and crew and to avoid all the inconveniences which are present in ordinary airplanes. To facilitate transportation the rear portion of the fuselage is demountable. The forward portion of the fuselage is covered with aluminum, the central portion with wood and the rear half with cloth.

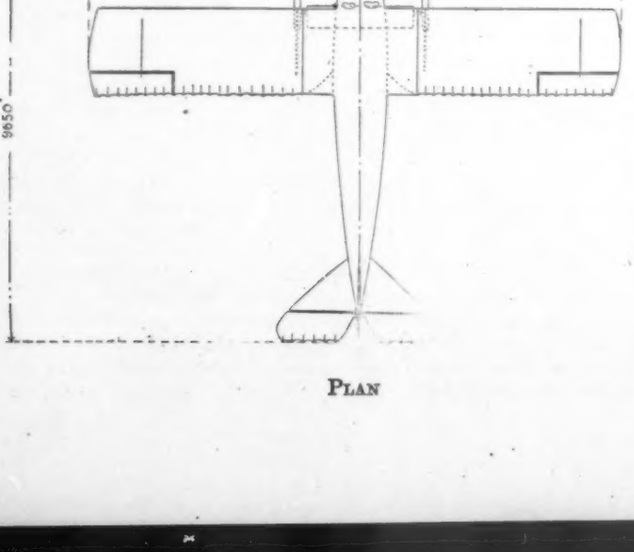
The upper and lower wings on each side are identical and this feature facilitates replacement. The cells, with the exclusion of the central portion, are braced with vertical struts made of round steel tubes faired to a streamline section. The bracing is streamline wire. The factor of safety of the wing structure is eight and a half.

The engine is a Fiat model A-12-bis delivering 300 hp. at 1600 r.p.m. and drives a tractor propeller. The radiator is placed in the nose of the machine and the cooling is varied by cutting out sections. The fuel passes from the main tank to a supply tank placed in the top of the pilot's cabin and from there to the engine.

FRONT ELEVATION



SIDE ELEVATION



PLAN

This machine is one of the designs of the engineer Brezzi and the firm of Ansaldo is one of the largest in Italy.

The main specifications are as follows:

Span	44	ft. 9.5 in.
Length overall	31	ft. 8 in.
Height overall	10	ft. 9.5 in.
Weight empty	2534	lb.
Useful load	1653	lb.
Total weight	4187	lb.
Total wing area	473.4	sq. ft.
Power loading	14	lb./hp.
Wing loading	8.85	lb./sq./ft.
Maximum speed	112	m.p.h.
Flight endurance	5	hr.

Lecointe Sets New Speed Record

Sadi Lecointe broke the world's airplane speed record for four kilometers (two and one-half miles) on December 12. Flying at Villa Coublay, Lecointe negotiated the distance in 46 seconds, or at the rate of 194.5 miles per hour.

A Stabilized Camera

By Capt. W. A. Hyde, A. S., Sig. R. C.

A very high degree of skill and training is required on the part of the pilot engaged in aerial photographic work to maintain a straight line flight with uniform speed at a determined elevation. The observer requires a camera in which the axis is vertical, hence the film horizontal, means for rotating the camera to allow for drift, means for determining the time between exposures and, above all, a suspension such that within reasonable limits, vibrations, jars and bumps due to the plane do not affect the camera. In other words, the camera should be stabilized.

During the war the writer was engaged on this work at Langley Field and as a result of much experimentation the stabilizer shown herewith, due to Dr. A. W. Duff was devised.

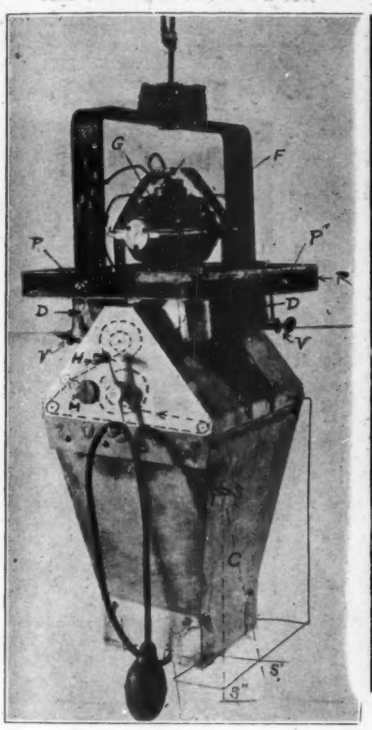


FIG. 1

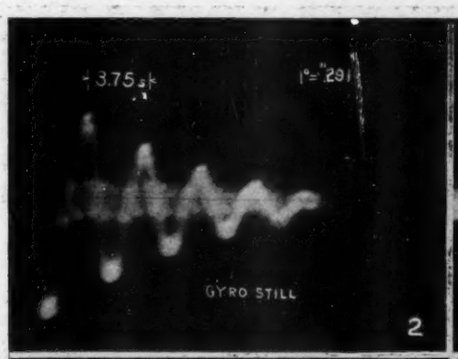


FIG. 2

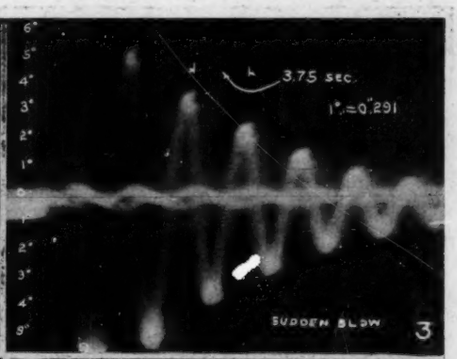


FIG. 3

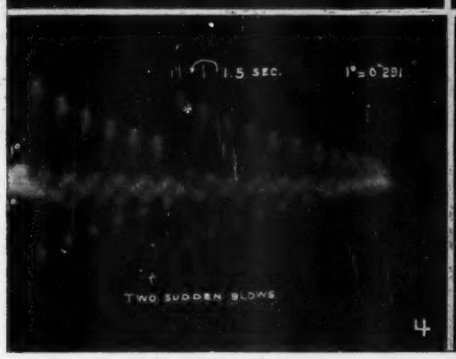


FIG. 4

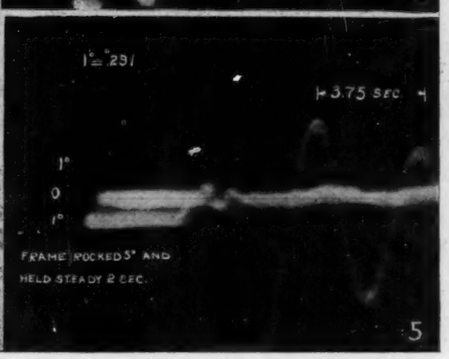


FIG. 5

The following photographs show it applied to a camera, laboratory tests as to its stability and finally a map showing performance.

At the outset it should be understood that complete stabilization of an airplane instrument under all conditions of flight has never yet been obtained, nor is it likely to be. In fact, one of the greatest problems in aviation is stabilization. Scientists have produced a highly refined stabilizer which under rather severe flying conditions and for a considerable period of time will show the vertical with great accuracy. The apparatus is, however, delicate, and not, so far, adapted to commercial use.

The conditions under which maps are usually made are often quite favorable to straight line flights, yet there are jars and vibrations besides disturbing air currents and efforts of the pilot to keep the course that give much trouble with the usual types of camera suspension. The stabilizer pictured herewith is a substantial type of instrument, simple and not likely to get out of order, which on tests has shown a surprising ability to keep the vertical under map making conditions.

Fig. 1 shows the stabilized camera used in the following tests. *C* is the camera body, made of tin, well blacked inside with shields to prevent reflection of light; *F* is the frame, which may be rotated about the screw to care for the drift of the plane as determined by the drift wires *S'S"*. The frame carries a horizontal gimbal ring *R* through pivots *P*. Pivots *P'* carry the frame in which the gyro *G* is mounted, which frame is attached to the camera *C*. As thus arranged the gyro and camera form a compound pendulum, pivoted at *P'*, the natural free period of which is of importance. The swinging of the camera about the pivots *P* and *P'* is checked by the dash pots *D, D*, the damping of which is regulated by the valves *V, V*. The apparatus thus becomes an internally damped gyroscopic pendulum stabilizer.

The function of the pendulum is to provide a quick return to the vertical; hence the period must be short. The dash pots not only prevent over-swing but tend to diminish and retard the departure from the vertical due to a jolt. The energy required to reduce this swinging comes from the gyro which spins at from 10,000 to 15,000 r.p.m., being connected to a 3-phase fan driven generator mounted on the landing gear.

The lens used was a Zeis-Tessar, f-6.3, of 7 in. focus, with an iris shutter, bulb operated. A film 5 in. wide was used, the roll taking about 50 pictures 4 in. by 5 in. The course of the film is shown by the dotted line; *H* is the winding handle; *M*, the marker. The camera returns to the vertical from any disturbance within two seconds so that it may be manipulated without fear of putting it out vertically. The time between exposures is determined by the passage of a target from *SS'* to *SS"*. This usually is done at the beginning of the flight and checked up occasionally. By "vertical" above is meant the resultant of gravity and centrifugal force; the tests indicate, however, that on slight turns the departure from the vertical is very small.

Laboratory tests on the behavior of the camera were made as follows: Mirrors were fastened to the frame *F* and to the camera body *C* and a spot of light reflected from them to a screen. A second camera, rotated, photographed the spots of light and drew them out into a wavy line if the frame or camera oscillated.

Fig. 2 shows two wavy lines, the outer one that due to the frame when tilted four degrees and allowed to oscillate; the inner one due to the camera. The gyro was not running, yet a maximum disturbance of one degree only is seen for the camera showing a certain degree of inherent stability in the arrangement. The line is quite uncertain, however, and indicated tremors due to building operations, footfalls, etc.

Fig. 3 shows the result of a sudden displacement of the frame of about 10 deg. With the gyro running the camera moves only about one half of one degree; moreover, the small vibrations such as would be expected from a gyro at 15,000 r.p.m. in the same mounting are all smoothed out.

The quickness of return from any disturbance is a vital factor in design; there is a proper relation between the natural period of free oscillation of the plane itself and of the pendulum. If the pendulum can always swing quicker than the plane, yet be damped so as not to over swing, the vertical will be retained. This refers of course to minor oscillations and not to banks or turns. In the previous illustrations the camera has a natural period of 3.75 seconds. This was now changed to 1.5 seconds and Fig. 4 shows the result of two sharp blows with resulting camera disturbances about as before.

Fig. 5 shows a condition simulating the result of a puff of wind rocking the plane to a new angle, holding it there momentarily, and a quick return. It will be noted that one half degree covers the corresponding disturbance of the camera.

Fig. 6 shows a part of a run made with this camera. It will be noticed that the centers of the pictures are very close to a straight line indicating that the pilot held well to his course. It is evident, then, that under favorable conditions errors due to a curved course can be eliminated largely. The close matching of the photographs at the edges shows that the film was practically horizontal.

In the progress of the work it was found that better results were obtained by flying to the desired elevation, determining the direction of the wind there and then flying directly up and down the wind. The pictures were taken on the "up" flight as a slower ground speed resulted, with more time between photographs; besides the plane was held to the course easier.

The preceding shows that it is possible to obtain pictures that will match direct from contact prints with apparatus not particularly expensive nor complicated.

FIG. 6

Prohibition of Airplane Flight in Austria and Germany

(Translations from Vienna newspaper.)

The communication published to the effect that all the airplanes now to be found in Austria were to be destroyed by order of the Inter-Alied Aviation Commission, may fortunately be considered merely in the light of a general declaration concerning which some misunderstanding appears to have arisen. This information was given today in answer to inquiries at the offices of the Commission. According to the Treaty of Versailles, war material alone belongs to the category in question. The clauses of the Treaty on this head could not be extended to civil aircraft without forcibly misinterpreting such clause.

As a matter of fact, it is generally known that the Inter-Allied Commission intends to promote aerial passenger circulation in Austria, and the erection of landing stages for passenger planes, at Aspern, near Vienna, and at Klagenfurt are now under consideration. According to the Peace Treaty, the ownership of all the airpanes in Austria constructed with war material and utilized as war machines falls to the Entente. Such material should have already been handed over under the conditions imposed by the Allies, but there have been various delays with regard to its delivery.

Paragraph 147 of the Peace Treaty prohibits all importation and exportation of airplanes, or of engines for some, within six months of the ratification of the peace treaty. Thus viewed, any flight made into Austria is considered as an attempt at importation, and it was for this reason that airplanes arriving from Munich were sequestrated. The above named period terminates at the middle of January, 1921. Until now, no communication had been received from the supreme council in Paris as to the eventual fate of the three Rumpler airplanes from Munich.

In answer to questions regarding the reason for the continued prohibition of flight, in Germany, now that the period of prohibition has elapsed, the Entente Commission declares it to be due to the fact that Germany has not yet entirely fulfilled her obligations with respect to delivering up aviation material and that the Allies must therefore insist on the fulfillment of such obligations.

As the same principle applies to Austria, the termination of the prohibition period, January 16, 1921, can only be considered as definitive if Austria shall have fulfilled all her obligations by that time.

The impending danger of the suspension of German aerial transportation has been averted. Various misunderstandings having been cleared up, the Inter-Allied Aviation Control Commission has withdrawn the obligation imposed upon various important German aeronautical concerns whereby long distance flights were prohibited in Germany.

Neither was any objection raised by the Commission with regard to long distance flights into foreign countries with civil airplanes only. The prohibition of flight into foreign countries with airplanes formerly used as miltiary machines is alone maintained. The German State Air Board signified its willingness to meet the demands of the Control Commission concerning circulation in foreign countries with such airplanes as have been utilized for military purposes, in order to avoid further loss to German aviation industry and aerial traffic; and the Air Board does not, however, depart from its view point that the Control Commission would not have been justified in withdrawing concessions once made, in accordance with which flights have been made into foreign countries within the last few months without any objection being raised with regard to the utilization of the airplanes then released by the said Commission.

Operation of a Rigid Airship

By Commander L. H. Maxfield, U. S. N,

Life on board an airship, like life generally, is one darn thing after another. There is nothing for idle hands to do because there are no idle hands. It is a life apart from any other activity known to man. It calls for the exercise of quick judgment and the closest attention to duty. People familiar with the sea who appreciate the romance of life on the deep, will find a surpassing interest in the story of man's latest navigating venture—sailing the air in an airship.

In connection with the purchase in England of the rigid airship popularly known as the R-38, but designated by the Navy, the ZR-2, a detachment is receiving instruction and training in rigid airships at the Royal Air Station, Howden, Yorkshire, England. When the Navy contracted for the ZR-2 one of the clauses in that contract included the training of this Navy personnel.

The work on the giant airship having reached a stage making it practicable to send a crew aboard, Commander L. H. Maxfield, U. S. N., with a number of officers and enlisted men, was despatched to Howden, arriving there on April 20, 1920. Instruction for the officers and men started immediately upon arrival and consisted of lectures, both theoretical and practical, on all subjects pertaining to the care, maintenance and operation of rigid airships, and practical work along the same lines. As instruction progressed and the theoretical work was completed, supplementary study in navigation, tactics and strategy, and other pertinent naval subjects were added by our own officers. At the present time these officers and men have become sufficiently trained and proficient so that the entire care and up-keep of the British Airship R-32 has been turned over to them, and all work on the ship is done entirely by our Navy personnel.

Commander Maxfield in a report to Captain Thos. T. Craven, U. S. N., Director of Naval Aviation, has given the most enlightening resume of the duties of an airship crew. Commander Maxfield says:

"It might be of interest to explain here just what up keep and maintenance work there is to do on a rigid airship and what is meant by 'preparing ship for flight.' In daily routine the first thing done is to take 'lift and trim.' This means calculating the total lift of the airship by adding up the amount of ballast, water, petrol, oil, and other necessaries—on board, and noting its location on a chart made for that purpose. In this way a record of the airship's daily lift may be kept and how the lift varies from day to day noted. Thus, if today's lift is appreciably less than it was yesterday, and no gas has been valved, there is obviously a loss somewhere, and an inspection is ordered made of the gas bags for leaks.

"By noting the location of ballast on board, the 'trim'—the tendency for lightness or heaviness in one end of the ship or the other—can be seen and compensated for if necessary, it being desirable to keep weights distributed as evenly as possible along the length of the ship to avoid stresses on the hull structure.

"After lift and trim is taken the crew are sent to cleaning stations aboard the airship and it is thoroughly policed. Engineers then do any necessary work on the engines and cars; riggers inspect controls, gas bags, valves, the outer cover, fin surface, in fact, the whole fabric, and do the necessary up-keep work; and, on the R-32 which has a wooden hull, the carpenters inspect and repair the frame work where necessary. Even in duralumin ships, owing to the extreme lightness of the girders in the hull structure, and the necessity of there being a large amount of climbing around on the girders, there is a considerable amount of breakage of small braces, wires, and gear, which makes it necessary for almost constant hull inspection and repair to be going on.

"The outer cover fabric gets torn or blown loose at joints which requires immediate repair to prevent small holes from becoming larger. The gas bags require a great amount of attention as the fabric, being very thin and light, chafes thin or through easily resulting in leaks and consequent loss of gas, lowered purity, and reduction in lift. Gas bags are inspected by going over them on the outside with a leak detector which registers any traces of hydrogen going through it. This is quite a tedious process as there is a tremendous area of fabric to cover and leak detectors are only about twelve inches in diameter.

"Gas bag inspection and repair is part of the daily routine and is carried out by the riggers detailed for this work. It is occasionally necessary to change a gas bag, taking out one which is leaking and losing purity rapidly and beyond repair in the ship, and replacing it with a new one or a repaired one. Bags taken out are air inflated and inspected and repaired where possible and within the capabilities of the station. Where this is not possible they are sent to the factory for repair or survey.

Once in a week the purity of each gas bag in the ship is taken, this serving as a check on the general condition of gas tightness of each bag and the ship as a whole. As the purity of the gas directly affects the lift of the ship no pains can be spared to keep the gas bags always in the best possible condition. Other routine work consists of checking tensions, weekly, of various wires, such as control surface wires, correcting any discrepancies, taughtening the outer cover periodically, cleaning and reseating water ballast discharge valves, and the general inspection of, and necessary work to keep all controls in order and funtioning properly.

"In preparing the ship for flight it is first necessary to know how large a crew is going to be carried and the length and nature of the flight, knowing this it is then possible to figure out just how much gas is needed to give the necessary additional lift, how much ballast must be put on board and carried, and how much fuel needed. The officer in charge of the operation having figured out just what is necessary, informs the chief engineer just how much fuel to take on board, advises the gas plant how much gas will be needed, and stations the crew at their respective stations.

"Gas is taken into the ship through a central gassing hose about twelve inches in diameter with leads off to each gas bag, and comes in directly from the storage holders through large gas mains sunk in the hangar floor. For the actual gassing, it requires four or five men stationed along the keel inside the ship to watch the amount of gas going into each bag and to tie them off when the proper percentage of fill is reached.

"One man is required to stand by the valve on the gas main to shut off or turn on as ordered and also the gassing coxswain, who is on duty on deck keeping track of how much gas is going into the ship, what bags it is going into, a list of bags filled and tied off, and other gassing details.

"Four riggers are detailed to put water ballast aboard as it is needed when the lift increases due to incoming gas. Water ballast must be put in with care to keep the ship's trim constant, as in rigids which are upward of six hundred feet long, too much water in one end or the other exerts an upsetting movement which will bring the over-balasted end down on the deck and exert an excessive lift on the other with consequent danger of damage. As water ballast goes in, petrol is also taken aboard, this work being done by the engineer's force under the direction of the engineer officer who is advised where to place it along the keel with further regard to the ship's trim. Water ballast and petrol must go aboard at a rate to compensate the lift of the incoming gas, keeping the buoyancy of the ship approximately the same at all times.

"When the ship is gassed, fueled, and ballasted, a very careful lift and trim is taken and charts made out showing the amounts and location of all fuel and ballast. These charts are posted in the control car and are referred to by the operating officers during flight. Engineers finally check and run all engines and the ship is ready for flight.

"When the ship is ready to go out, the flying crew gets on board, sufficient ballast being discharged to compensate for the

weight of the crew taken on board. The ship is taken from the hangar by the ground party who man the various handling guys, this operation being in charge of an experienced officer as inefficient or inexperienced ground handling is very apt to dangerously hazard the airship. Before being taken out of the hangar the ship is ballasted about 1,000 pounds light, to facilitate its handling, and so it will have positive buoyancy in leaving the ground. As soon as the ship is sufficiently clear of the hangar the stern is allowed to pay off, putting the ship's head to the wind, in which position it is walked to the desired point for 'taking off'. The ship is again weighed off to finally check the lift and trim, and if this is satisfactory to the commanding officer, the motors are started and the ship released by the handling party at the given signal.

"The ship in flight is operated as far as possible along the lines of any seagoing operation, and orders are given and watches stood and relieved similarly. In flight, there are normally on duty in the control car the captain of the ship or the first lieutenant, the senior navigating officer and an assistant navigating officer, one other watch standing officer who relieves the captain or 1st lieutenant when requested, and otherwise makes frequent tours of inspection along the keel to see that the gas bags are positioned properly, the valves functioning, and the riggers on watch are at their station and performing their duties.

"There is also on duty, in the control car, the height and direction coxswains, who stand two hours' watches at these controls. All other watches are relieved every four hours. In the present ships; where the radio cabin is in the control car, there is also a radio operator always on watch. In the power cars there is one engineer always on watch, the relief engineer off watch resting in the crew space in the keel. There are two to three petrol men in the keel who keep the supply tanks to the cars filled, the air pressure on them, and pump petrol from the reserve tanks to supply tanks, or from tanks in one part of the ship to another when necessary to fill certain supply tanks or to alter the ship's trim.

"Once every two hours the petrol supply is checked to ascertain the amount remaining and its location, and the petrol chart in the control car is posted accordingly. The engineer officer patrols between the various power units, checking their operation at frequent intervals and also the petrol system in the keel. If it is not desirable to utilize all the power units, the engineer officer advises the officer having the deck in the control car, the units to be used, either keeping certain units in reserve or overhauling them. Orders from the control car to power units are transmitted by engine telegraph similar to ship engine telegraphs, but, of course, designed for airships.

"These have proven amply adequate, and very satisfactory in their operation. When it is desired to 'conn ship', orders are given the steersman in accordance with standard navy practice. Orders to the height coxswain are given in a similar manner, but with variations to suit the circumstances.

Meals are served at regular times and very palatable ones, to. There are two cookers attached to two of the power units, and hot coffee or chocolate and a certain amount of hot food can be served. One of the crew is assigned the post of cook and prepares and serves the meals.

"In landing, which is done at a set time, in accordance with radio messages from the station or base, the crew are piped to landing stations, where they remain with as little movement as possible, while the ship is put in trim and its buoyancy checked and regulated to the amount of lightness desired by the captain. The station is radioed for the ground wind, its direction, the temperature, and barometric pressure, which, when received, enables the captain to make the necessary landing calculations.

"The ship is 'conned' to the landing party and brought down into the wind low enough to bring the handling guys or the trail rope within their reach, the ships way being checked either by shutting down the engines, allowing it to lose way, or by running the wing engines astern, the object being to have the ship arrive at the landing party with no forward speed. The ship is then walked into the hangar and secured, the crew disembark, and ballast is put aboard to compensate for their weight. This, in general, is the routine of airship handling, both on the ground and in flight."

South Pole Mapping Expedition

The newest Antarctic expedition, headed by John L. Cope, now on its way to explore unchartered lands toward the South Pole, has left Hampton Roads and started for the Polar regions. The members expect to be gone for two years. If they are not heard from then, a relief expedition will be sent out by the British Imperial Antarctic Expedition, backers of the enterprise.

The ease of exploration is expected to be heightened by the use of airplanes, designed by Blackburn & Co. of Leeds for Polar use. The new airplanes have an "all clear wind screen," which the inventors predict will prevent any obstruction of view by the snow. Instead of wheel landing gears the new airplanes are constructed on skis.

Mr. Cope on his present expedition is taking one of these airplanes, built for test purposes, with him. It will be used as an experiment in the early stages of his trip. Captain George H. Wilkins of the Australian Flying Corps will pilot the airplane. He attributes past failures in the use of these machines in low temperatures to the inability of the designers to develop the right kind of engines. In the machine for the Cope expedition the power unit will be enclosed in an insulated chamber and it will be artificially heated to a known satisfactory working temperature.

The danger of blizzards is recognized, and on this account the airplane of the expedition will be of folding type, both as to wings and fuselage, easily dismantled into the smallest possible space; a light type of hangar will be carried with the plane. Supplies will include tents, sledge, ice picks and a three weeks' food ration.

What Capt. Wilkins regards as of prime importance for the airplane is the work along the coasts. He expects the plane to deliver a complete photographic record of the areas covered.

Because of the possibility of covering wide areas in a single days' flight, flying time can be selected when bright sunshine renders conditions ideal for photography. It is estimated that in three flights—250 miles in one direction, fifty miles at right angle to it and returning on a parallel to the outward course—to cover a stretch of coast 500 miles long and fifty miles wide. Such flights can be made in eight hours. They equal eighty days' sleigh travel. In the event of mishap the men would never be more than twenty-six days' sledging from their base.

The use of the airplane for investigation of cloud movements and upper air temperatures is regarded as indispensable, and the planes are expected to throw light on the everchanging mass around the polar continent, now little understood.

Floating Test of DeH-4

A novel experiment was conducted by the engineering department at Luke Field, Hawaii, recently, which resulted in the partial settlement of a long dispute. With the ever-present possibility of landing in water with the land planes that are flown among those islands, and with the several instances where forced landings have been made in water, it was deemed advisable to run a test on a DeH-4 plane to determine just how long it would remain afloat.

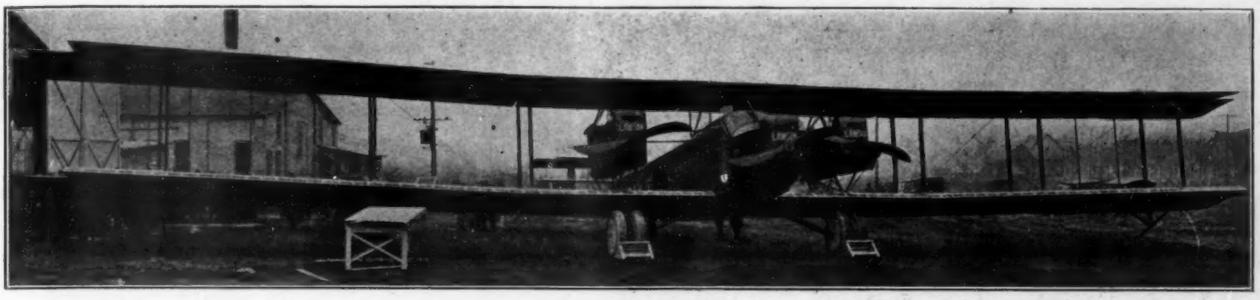
A salvaged plane was patched up and filled with water and gas, and weighted with two sand bags, one in each cockpit, and all conditions were met to simulate a plane having had an actual forced landing. The plane was then taken out in the bay and set afloat. There were many and varied opinions as to how long it would stay above the surface, and wagers were made accordingly. In the first forty-five minutes the plane sunk so rapidly as to leave but half the fuselage, part of the upper wing and the tail surfaces exposed above the water. This point, however, seemed to be the floating level and from then on it sank very slowly until at the end of two and one-half hours over half of the stabilizer and all of the rudder were still exposed.

At the end of four hours the plane had drifted in shore and was grounded with the stabilizer submerged, but with the rudder still above the surface. Just how much longer it would have floated is still debatable, but the experiment was successful in showing that it could be depended upon several hours afloat if a reasonably good landing were made in a comparatively smooth sea.

The Lawson L-4 Transport Airplane

The new Lawson machine is intended to be used on the airways for which the Lawson Airline Co. has mail contracts. It is a three-engined central fuselage biplane. It is expected that different styles of fuselage interiors will be used depending on the type of load to be carried. The machine is designed to be handled by a crew of three; consisting of a navigator, a pilot and an engineer. The navigator and the pilot have dual controls and occupy a separate cabin in the forward part of the fuselage.

These machines will be among the most luxuriously fitted passenger airplanes built to date. Some will be fitted with Pullman berths and a wash room equipped with a shower bath. The seats all face forward in pairs on the right side and singly on the left side with an aisle between.



FRONT VIEW OF THE LAWSON L-4 AIRPLANE

The design is an extremely simple one and does not appear to employ complicated fittings at any point. A new departure in this country is the provision of a trimming plane distinct from the remainder of the empennage.

Fuselage

The pilot's cabin is separated from the main cabin by a double hinge door in which is placed a beveled glass window so that either pilot or navigator may see into the passenger cabin and talking tubes are placed through this door so that the captain or pilot may talk directly to the mechanic who sits in the first seat of the regular cabin.

In front of the controls is a mahogany dashboard equipped with a complete set of instruments, such as three sets of Delco boosters, tachometers, oil pressure gauges, and water and oil thermometers. There is also a clock, altimometer, air-speed indicator, vertimeter, and lateral and longitudinal inclinometers. A word might be said of the tachometers. Due to these being installed on the dashboard in the pilot cabin, the shafts that run to the engines are attached to right angle reduction gears, which drive the long shaft one-fourth crank shaft speed, a large factor in preventing shaft whipping or breakage where changes of direction take place. These shafts as well as the air, oil and water thermometer lines, run through streamline cases between the body and the nacelles.

Between the pilots, and mounted on top of an aluminum pedestal, are the throttle levers so arranged, that any one or all engines can be controlled at the same time. On the face of this pedestal and about four inches below the top is a hand wheel for operating the trimming plane. The throttle controls are positive throughout the entire system, being composed of steel tubing, which rotate or push and pull, as the case may be.

The "Dep" control is used. Instead of the usual chain drive, bevel gears rotate a vertical shaft running through the main column, which has a pinion at the base driving a rack. On the outer ends of the rack the aileron control cables are attached, these running directly out to the wings after passing over large directional pulleys.

The elevators are operated by doubled cables running under the floors on the left side of the body, to a rocker shaft placed on the top longeron in back of the cabin. Several inspection doors are placed on the floor of the cabin for these as well as the rudder cables, which also are arranged similarly to the elevator control cables.

On a separate dashboard overhead and between the pilots are placed the switches. Near the seats are placed fire extinguishers.

A mechanic's dashboard is placed in the front end of the main cabin on the right side. This is equipped with air pressure gauges and an air distributor tank into which the air is pumped from the engines, for the air pressure gas system, and properly distributed to the respective gas tanks. This tank is always primed so it is an easy matter to start all three engines. Alongside of the dashboard are the ignition control handles for advance and retard, these being push and pull rods to all engines.

The cabin itself is of the convertible type, having attachments for twenty-six seats, berths and mail compartments. When used as a day machine all twenty-six seats are installed and when used as a sleeper there are six seats and berths. These latter are the disappearing type and can be extended within a few minutes. The machine carries a complete lighting system for dashboard, cabin lights, wing and tail lights, and a large searchlight and a heating system. At the rear end of the cabin, and on the right side of the machine, is located the main entrance door. Directly across from this door on the left side of the machine is a complete bathroom. There is a shower bath, wash-stand and towels, mirror, drinking water and lavatory. A large overhead water tank of both hot and cold water is used for the shower while the tank containing ice water is used for drinking purposes. The whole compartment is white enameled with white rubber draw curtains on the windows and entrance, while the floor is tiled.

Behind the bath room is a mail chute and baggage room. This is reached through a door which also allows entrance for inspection of the rear end of the body. An inspection walk runs from this door to the stern.

Constructionally the body is composed of spruce longerons the entire length. These are pin jointed at the front allowing a complete removal of the whole front engine with its controls, and attachments, radiators, etc. The longerons are again jointed immediately behind the rear end of the cabin, thus allowing the whole tail to be removed and a new one installed, thus causing little wastage of time in making repairs.

The complete cabin section is composed of laminated spruce bulkheads. The cabin is completely covered with veneer with light stiffening pieces. The windows are of safety glass while those in the pilot cabin are of celluloid due to the convex curves of this section. The rear end of the fuselage is standard construction having spruce struts and cables and is linen covered. At the extreme rear end and around the tail plane and tail skid section the body is again covered with veneer to stiffen this portion and prevent twisting.

The interior of the cabin is finished in mahogany and cream and the floor is covered with a heavy green brussels carpet while the outside is enameled green throughout.

Wing Structure

There are five sections in the upper and four on the lower plane. They are of the usual construction consisting of two spars of I-section made of spruce and laminated in two pieces with hardwood strips top and bottom. The ribs are of the girder type and are of spruce throughout. All ribs are of standard section there being no special ribs in the whole struc-

ture. Square spruce struts carry the compression. The engine section panels internal wires in both directions while all other panels are 3/16 in. cable doubled for drift loads and single for trueing.

Large balanced ailerons are used top and bottom and are connected by streamline tubing instead of wires, thereby eliminating continual care and attention. Celluloid inspection doors are placed at all aileron control cable pulleys on the lower wings. Spruce struts of streamline section are used externally. All cable strut fittings are of the internal type concentrating all loads on the neutral axis of the spar.- As in the body and other parts these fittings are chrome vanadium steel, heat treated and zinc plated.

On each end of the wings and under the outer struts are ash wing skids which are sprung by rubber shock absorber cord covered by an all-metal streamline case. To the skid is hung

REAR VIEW OF LAWSON L-4

a tube which telescopes into another tube mounted on a ball and socket joint to the rear spar. The front end of the skid is hinged to a fitting on the spar while a diagonal tubing takes the side action. The wings are linen covered and coated with clear varnish. The factor of safety is six throughout.

Empenage

This is of biplane type having balanced elevators and three rudders, the outer two which are also balanced. In front of the rudders are vertical fins. The construction is similar to the wings. To relieve the weight of the elevators upon the pilot controls these are equalized by rubber absorbers attached to a lever upon the rocker shaft in the rear end of the body. The elevators are also connected together by tubes in the aileron system. The vertical fins are provided with adjustable screws on the top of the front ends, thus allowing the top tail plane to be set to any required angle.

A trimming plane is installed just ahead of the tail plane which can be adjusted in flight from the pilot, cabin by a wheel before mentioned. This is worked by a screw and trunnion so the setting is at all times positively locked in position. All vertical settings are enameled green while the horizontal surfaces are finished similar to the wings.

Landing Gear

Four large Palmer wheels of 1250 mm. x 250 mm. or 49 in. x 10 in. are used. These are placed upon short axles of high grade steel tubing which in turn are slid over cast steel elbows on the inner ends. This elbow is fixed to heavy compression tubes running up to the body and are pinned there. The Vee is triangular shape made of laminated spruce with the grain of the wood arranged as in the body bulkheads. On each side of the apex of the Vee are the rubber absorbers placed in line with the Vee. The nose and tail of the shock absorber brackets are cased with streamline fairings. The tail skid is rubber absorber sprung and is universally mounted to the body by four steel tubes. In case of failure of any part of this member the machine will fall upon a streamline bumper secured permanently to the sternpost.

Nacelles

On each side of the body and between the top and bottom wings are placed the nacelles. These are of spruce longerons laminated bulkheads and struts, braced by 3/16 in. cables. The engines are directly behind laminated spruce nose pieces having vents for air circulation. The nacelles are completely covered with aluminum excepting the nose pieces and all sides excepting the bottom are provided with large doors. The gas tanks in the rear end of the nacelles are protected by an aluminum fire plate. The bottom of each nacelle is formed to a well shape where oil and refuse may collect and drain out through pipes.

The oil tanks are placed alongside of each engine and where they will receive a certain amount of cooling as well as allow a small amount of piping. Both engines are equipped with carburetor stacks which direct back firing out and away from the nacelles or tanks. Long exhaust pipes help to direct any flames away as well as to deaden the noise and carry any oil away.

Inserted in the entering edge of the top wing are water header tanks. These are connected to the engine water outlet and radiator inlet pipes through large diameter pipes which also help to cool the water due to their exposure to the air. On either sides of the nacelles and behind the engines are the radiators suspended on steel tubing and brackets. Although rather small after they have been installed in this position careful experimenting and tests which indicate this position the best for cooling purposes. All radiators are equipped with shutters on the rear side these being operated by levers in the cabin. Each pair of radiators being connected together can be worked independently for any engine desired.

The center engine, as mentioned before, is mounted on a detachable nose. The nose piece is similar to the nacelle nose piece as is the cooling. It is also equipped with carbureter stack. The fuel tank for this engine is under the pilot's cabin. It will thus be seen that each engine has its separate gas system thereby eliminating considerable trouble in case of a leak. All pipes and wiring are marked with standard specification identification colors to allow quick inspection, repair or assembly. An aluminum fire plate attached directly to the bulkhead, separates the engine from the cabin.

Main Dimensions of Lawson L-4

Span	120	ft.
Overall length	62	ft.
Overall height	18	ft.
Upper wing area including ailerons	1250	sq. ft.
Lower wing area including ailerons	1175	sq. ft.
Total aileron area	298	sq. ft.
Wing section	U. S. A. 5	
Chord	10.6	ft.
Gap	10.3	ft.
Upper stabilizer area	68	sq. ft.
Lower stabilizer area	63	sq. ft.
Total elevator area	116	sq. ft.
Trimming plane area	68	sq. ft.
Total fin area	36	sq. ft.
Total area of rudders	48	sq. ft.

POWER PLANT

Three standard Libertys, 400 hp. each. 1700 r.p.m.	1200	hp.
Three propellers, 10 ft. dia. 6 ft. 6 in. pitch		
Fuel consumption of each engine at 1700 r.p.m. .5 lb. hp. hr. (5.5 lb. /gal.)	36	gal. /hp.
Oil consumption of each engine at 1700 r.p.m. .0373 lb. hp. hr. (7 lb. /gal.)	2.13	gal. /hr.
Fuel consumption of three engines	108	gal.
Oil consumption of three engines	6.39	gal.
Nacelle fuel tank capacity (2)	490	gal.
Center engine main fuel tank capacity	149	gal.
Center fuel engine auxiliary tanks (2)	94	gal.
Total fuel capacity	733	gal.
Nacelle oil tank capacity (2)	36	gal.
Center engine oil tank capacity	22.2	gal.
Total capacity of three overhead water tanks (3)	18	gal.

WEIGHT DISTRIBUTION

Structural weight, including wings, fuselage and nacelles complete, trimming plane, control surfaces, and landing gear	7434	lb.
Power plant, including water and tanks, gas tanks, piping and wiring,, nacelle tanks, propellers and radiators	4560	lb.
Fuel and oil	4589	lb.
Passengers, baggage and mail (as mail machine)	3570	lb.
Passengers, baggage and cargo (as passenger machine)	4360	lb.

	Mail	*Passenger*
Total weight (lb.)	21462	22820
Horsepower	1200	1200

PERFORMANCE

Endurance at full power (ground level) at 108 gal. /hr.	6.78	hr.
Endurance at full cruising speed (6000 ft.) at 70 m.p.h. (1400 r.p.m.)	11.5	hr.
Maximum speed	112	m.p.h.
Landing speed	53	m.p.h.
Range, full speed (112 m.p.h.)	825	mi.
Range, economical speed (70 m.p.h.)	800	mi.
Service ceiling	22000	ft.

A Remote Control Compass

By Dr. Alfred Gradenwitz.

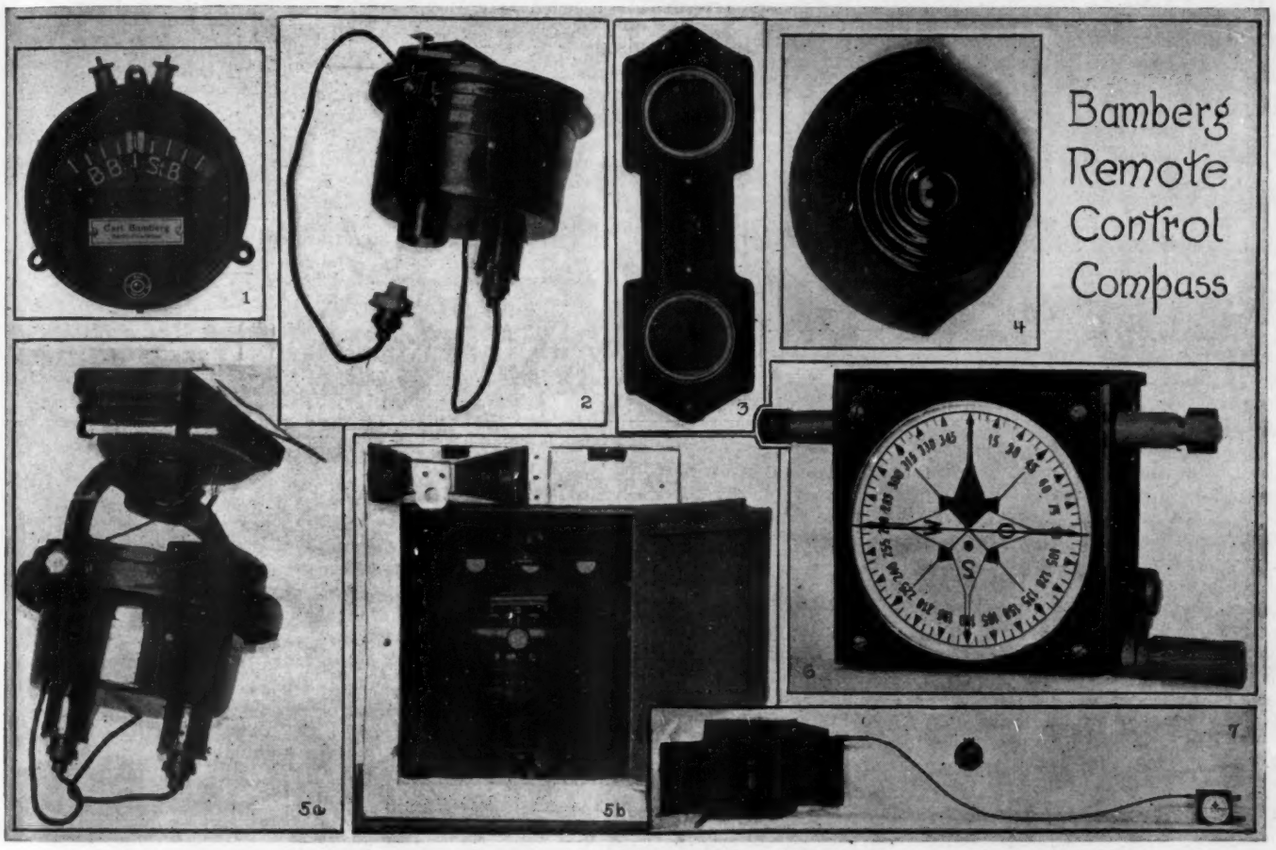
Aviation has in the course of the last few years taken so thriving a development that the design of suitable apparatus for finding one's way in the ocean of atmosphere has not been able to keep pace with it. Though the magnetic compass is the most suitable instrument enabling the flier to keep his course, conditions in this case are incomparably more difficult than on board sea-going vessels.

Periodical vibrations, pitching and rolling, in the case of airplanes, in fact, are much more rapid and troublesome than on board ship, being liable to get into resonance with the compass dial and thus to give rise to deflections. A particular difficulty, however, is due to the fact that the compass, in order to be handy for the pilot, must, as a rule, be installed in the neighborhood of bulky iron and steel parts.

It has therefore been suggested to divide the problem into two parts, viz., adjusting and keeping one's course respectively. In fact, during the flight the pilot is interested only in knowing whether, and to which side, he is deviating from the proper course, the course itself being of importance to him only at the beginning of the flight or whenever the direction is to be altered. The outfit designed by Carl Bamberg, of Berlin-Friedenau, comprises instruments for ensuring a flight in a straight line as well as for adjusting the proper course.

What the pilot has in front of himself, is not the compass proper, but a simple electric gauge, shown in Fig. 1, the hand of which will deflect in the case of any deviation from the course. This course gage is connected by electric conductors with the compass proper, which can be installed at any point desired in the airplane. Suspending the compass in one of the tail cells has proved an especially good plan, inasmuch as deviations there seldom exceed 1 deg., so that compensation, as a rule, can be dispensed with.

The magnetic system of the compass is as substantial as that of a ship compass; it is therefore extremely stable and endows the compass with the same accuracy as a ship's compass. It is floating in a relatively spacious bowl, filled with alcohol, at the bottom of which there are fitted two lighting systems (Fig. 2), each made up of an electric incandescent lamp and a condenser (lens system), projecting a well defined beam of light upward through the compass liquid. These two beams of light fall on two selenium cells, hermetically enclosed in a bridge above the bowl (Fig. 3). Such cells are known to exhibit a decrease in electric resistance under the impact of light, so as to allow an electric current to pass and to cause the hand of an electric gage to deflect.



The magnetic system carries a diaphragm which in a certain position will hide both beams of light, thus leaving both selenium cells in the dark (Fig. 4).

On turing the compass bowl with regard to the magnetic system pointing north-south, one or the other cell will be lighted, the hand of the electric gage (the course gage above referred to) will deflect to one side or the other. This is how any rotation of the compass bowl with regard to the magnetic system is read on the gage, the deflection of the hand increasing and decreasing along with the rotation, that is to say, the deviation from the proper course. This is insured by conveniently bevelling the edge of the diaphragm, so that the lighting intensity, as the compass bowl is turned round, will increase or decrease gradually, thus giving rise to a corresponding decrease or increase of the electrical resistance of the selenium cell.

If such a compass be installed in a vessel or an airplane it can be steered accurately in the direction of the magnetic meridian by means of the course gage, any deflection therefrom being equivalent to a rotation of the compass bowl with regard to the magnetic system and thus being indicated by the gage. The pilot has only to act on the rudder to the right

or left, according as the instrument is deflecting to the right or left.

If the compass bowl be turned a certain angle, say 90 deg., with regard to the airplane axis, the course, on flying according to the course gage, will deviate 90 deg. from the magnetic north-south direction. Any course desired, e. g., 90 deg., can thus from the beginning be adjusted for by turning the compass bowl through the same angle with regard to the airplane axis. To this effect, the compass bowl is fitted in a suspension arranged to be turned by means of a worm. (Fig. 5).

The pilot will adjust the proper course in the simplest possible way by turning the handle which by means of a flexible shaft causes the bowl to turn round. The same shaft causes a compass dial to perform exactly the same rotation as the bowl, thus allowing the angle of rotation, that is to say the compass course adjusted, to be read on the dial. This dial arrangement is termed "course transmitter". There is, of course, no objection to installing several such arrangements, the same as several course gages, in the same airplane, so that the pilot as well as the observer and possibly any passengers, can superintend and control the outfit. (Fig. 7).

The current required for operating the outfit, at most 10 watts, can either be derived from an existing source of at least 16 volts or from a specially fitted small generator driven by a propeller, weighing only about 1.8 kg.

In order, to keep a given course, say, 105 deg., all the pilot has to do is to turn the crank of the course transmitter, until the figure 105 coincides with the steering line. The hand of the course gage then will deflect until the airplane by actuating the vertical rudder has been accurately adjusted to a course of 105 deg. Steering according to the compass dial, an awkward operation to fliers who do not at the same time happen to be skilled seamen, is thus done away with, the flier having merely to watch the readings of a simple hand, such as that of any other instrument he is acquainted with.

The problem of automatic steering by means of the selenium compass has likewise been solved in principle.

Influence of Aviation on Cities and Farms

By C. F. Redden

President, Aeromarine Engineering and Sales Company

An hour is still an hour, and there are still only twenty-four to the day, but nevertheless the hour has expanded tremendously in the last century. In 1820 an hour in terms of distance was six miles. Now it is sixty. Tomorrow it will be 120 to 150 miles.

No field of business has been more profoundly affected by this change than the real estate business. And it requires no prophet to foretell that real estate in the next five or ten years is to benefit far more greatly than ever before by the stretching of the hour.

A hundred years ago, land, ten miles from the limits of a big city was farm land and not necessarily valuable farm land at that. To transact business daily in the city from such a distance was so arduous as to be entirely impracticable. Consequently real estate so far away commanded only its price as farm land. For centuries it had remained farm land, peopled by country dwellers, farmers, as distinct from city dwellers, who lived within the circumference of the city.

The railroad and the steamboat came along and slowly developed. To relate what they did to real estate values a short distance from the city is unnecessary. Suffice it to say that during the past hundred years land ten to twenty miles from the limits of the city became suburban property immeasurably more valuable than farms. The commuter came into being, for the distance to the city was contracting, or to put it in another way, the hour was stretching.

Until the automobile came along, however, it did not stretch very far, for there was still the railroad station to reach by the slow process of harnessing up and driving there; trains were infrequent, and their speed by no means extraordinary. The motor car added millions to real estate values by increasing the circle around the city within which people with daily business in the city might dwell. As suburban neighborhoods developed more trains were added and up went values again.

The limit now for commuters is a scant thirty, forty or fifty miles, even in localities served by the best railroad service, but a new means of transportation promises surely to double or treble this zone of residences, and add billions to the real estate value of what is now farm land throughout the country.

The housing problem too will no longer be a problem and the effect on the mode of living and health of the people will be as marked as that wrought by the motor during the past twenty years.

Just as the railroads and the motor car extended the hour from six miles to sixty miles with its consequent increase in land values lying within commuting radius of metropolitan centers so will airplanes and flying boats extend the residential and suburban radius from sixty miles to two hundred miles and change real estate values accordingly.

Men who have summer homes at Lake George, Cape Cod, and the Eastern end of Long Island, who now can only spend week-ends at their country estates, because of the present slow methods of transportation, will in another year or two commute daily by airplane, or flying boat, because they can cover the distance in one third or one quarter of the time now required by the fastest trains and in perfect safety and with none of the heat, dust and grime of land travel.

Busy business men in Chicago will fly to the Lake District in Wisconsin or across Lake Michigan to some of the beauty spots of Michigan, one hundred or one hundred and fifty miles away in about the same time that is now required to commute from Highland Park or other suburbs twenty or thirty miles away. The effect on real estate of this new mode of transportation can be easily seen.

When a man of affairs in San Francisco, Los Angeles or Seattle can plan his residence one hundred miles from the city up or down the coast and fly to and from his office in less than an hour, the change in present realty values in those outlying districts will run into the millions.

There are skeptics now as there were skeptics in the nineties, when ridiculous little automobiles puffed feebly along, when prominent bankers considered Henry Ford insane because of his statement, at that time, to the effect that he intended to build 10,000 automobiles.

There are also a good many optimists who are preparing throughout the country to profit by the new order of things aerial transportation will open to us. Here in the East hundreds of men, prominent in finance and industry, have had their "Baptism of the Air" and have commuted from New York to their country homes one hundred or two hundred miles away. They are convinced that the kind of aerial transportation afforded by flying boats is safe and practicable, because so long as you fly over water a convenient and safe landing place is available.

Aerial transportation companies are already being organized throughout the country to operate flying boats for passenger, freight, and mail carrying purposes. This type of transportation offers many advantages aside from the speed, comfort and safety of the passenger. To establish quick aerial transportation between two points it is not necesary to expend years in surveying and grading and invest fortunes in road beds, bridges, terminals, etc. As soon as the American public awakens to the safety and charm of air travel there will be a net work of air lines carrying business men one hundred miles into the country to their summer homes and transporting the products of the farm to the cities in as many hours as it now requires in days.

Underwriters' Laboratories and Aviation

By A. R. Small

Vice-President, The Underwriters' Laboratories

The actual and prospective developments in the use of aircraft in the commercial transportation of both passengers and freight have created a demand for insurance protection of the capital invested. This demand is now being met by certain insurance companies and the organization of aircraft departments is having careful consideration by other companies.

Analysis of the problems encountered by the aircraft underwriter shows the technical and enginering matters are of first importance. Accordingly the National Aircraft Underwriters Association is arranging to give formal and practical recognition to reports made by Underwriters' Laboratories covering the design and equipment and the insurance classificatin of aircraft.

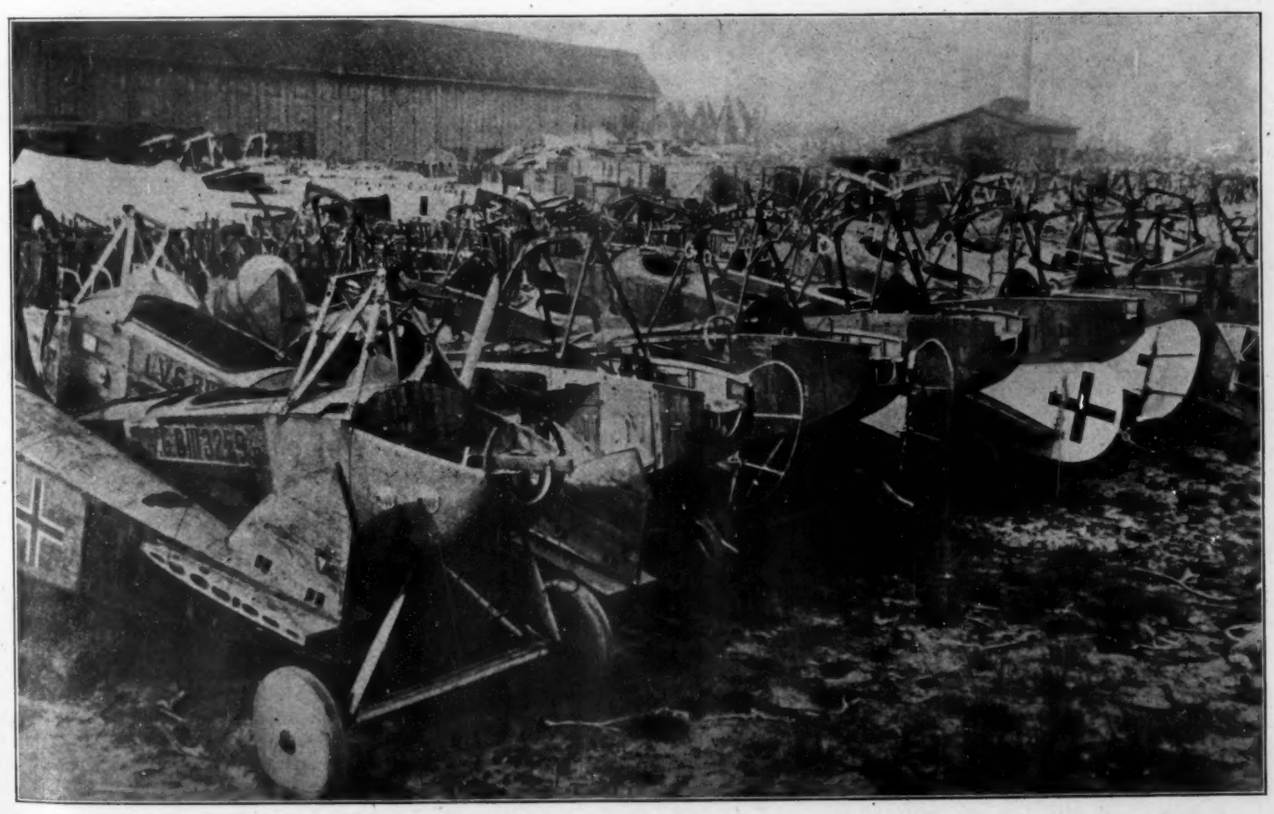
There is a striking analogy between aircraft underwriting and the marine field. In both there are three main factors of risk namely, the operating personnel, the harbor and landing facilities and the routes and third the construction and worthiness of the craft. This analogy moreover is apparent not alone with regard to insurance or underwriting but already has been applied in plans for federal, state and local regulations for all civilian aircraft use.

The present article considers the third phase or class of underwriting problems. Others will discuss the underwriter's concern with the operating personnel, the crew in other words, and in the routes covered and the harbor or landing facilities along them and at their terminals.

The problem of air-worthiness either generally or for a specific service and definite route is obviously of major importance. The most skillful pilot cannot avoid crashing, if his machine is unreliable or defective either in design or through faulty assembly or indifferent upkeep. A well planned and managed airdrome with landing fields or moorings and other facilities of the best do not guarantee safety for machines not fit to fly. Particularly at this period in the history of aircraft is it most difficult for an underwriter to classify available types and makes of machines. The aircraft industry is in a stage of transition. The World War demands forced development in certain directions, some of these opposed to the requirements of commerce. Thus we have seen demands for speed regardless of cost of operation and for maneuverability with some loss of stability. Ceilings have been higher than most demands of commerce require, etc. Accordingly the underwriter, observing a need for technical and engineering analysis and classification of the machines he proposes to insure, has turned to Underwriters' Laboratories for assistance.

This he is doing not because the Laboratories now is equipped with the staff and facilities necessary for this work, but because an appreciation of the insurance or underwriting point of view is all important for his purpose and because the technical and engineering aspects of the various problems must be considered from the underwriters' angle.

The management of the Laboratories is now developing plans for a special department to handle the engineering and technical plans of the aircraft problems. While no decision has been reached as to personnel or equipment, several broad policies have been determined upon. Some of these are of long proven worth and have been demonstrated by experience in other fields. Consultation and cooperation with industries has long been a fundamental principle of the Laboratories' procedure, in accordance with which cordial relations have been established and maintained with manufacturers' organizations such as the Rubber Association of America, the



GRAVEYARD OF GERMAN AIRPLANES AT JOHANNISTAL

Photo International

Associated Manufacturers of Electrical Supplies, the International Acetylene Association and the National Automobile Chamber of Commerce. Similarly in aviation a point of contact has already been secured through the appointment of a standing committee of the Manufacturers Aircraft Association, Inc. through which interchange of views on matters affecting policies and broad relations can be effected.

Recognition of existing standards and state of art is a second fundamental policy observed by the Laboratories' management. To adopt and apply so far as is consistent with insurance needs the current standards of an industry creates the least possible friction and secures in the end a larger measure of useful results. So far as practicable the standards and specifications for materials and for equipments already established will be recognized and applied.

The Society of Automotive Engineers has been asked to appoint a committee through which advice and constructive progress in engineering standards can be secured. The Specifications of the Airplane Engineering Division of War Department as published by the bureau of Aircraft Engineering and of the International Aircraft Standards Board will be utilized so far as they apply. Also advantage will be taken of the excellent research work already completed or now being done by the Bureau of Standards for the National Advisory Committee on Aeronautics. Contact will be maintained with the Navy, the Post-Office and other divisions of the federal government.

The National Safety Council has established an Aviation Section providing a forum for discussion of matters relating to safety in the use of aircraft. An officer of the Laboratories is to serve as chairman of the sub-committee on Planes and Engines of this section.

The cost of examination and test work leading up to the classification of aircraft and of devices and materials used in their construction and operation will be distributed in general along the lines of the Laboratories current work in other fields of insurance engineering.

While the Laboratories are operated for service not profit, the principle of charging fees for the cost of work done in examining and classifying proprietary articles is necessary and will be continued. Otherwise many demands would be made for work not of real concern to insurance organizations and of interest principally to inventors and promotors.

The test work to be done is in two principal sorts. The first is the examination and testing with a view to listing the various materials and devices employed in the assembly and equipment of aircraft. Of this class are the following: fittings of either ferrous or non-ferrous metals; such as turnbuckles, clevises, landing gear parts, specialty bolts, washers, nuts, thimbles, etc. and parts of wood or composition material. Electrical accessories; lamps and lamp fittings, wires, cables, switches, relays, generators, motors, batteries, etc., Instruments; tachometers, inclinometers, altimeters, clocks, etc., Accessory hardware; safety belts, gasoline tanks and fittings. Devices such as are indicated above when examined and classified are to be required or permitted in the assembly and equipment of airplanes or other aircraft. The Laboratories contemplates the publication of lists of such appliances corresponding to its present lists of inspected electrical fittings, mechanical appliances, etc.

Then there will be the work of classifying completely assembled airplanes as to type, design, equipment and ability in operation and the facilities and practices of manufacturers. The several problems to receive consideration are:

Type: Service record if any, of previous airplanes. Countercheck of computations of structural and aerofoil stresses including analysis of engine and propeller performance and design. Sandbag and flying tests.

Design: Variations from established and proven designs. Consideration of design for intended service.

Equipment: Involving use or proven or standard materials and devices.

Facilities and practices of Manufacturer: Shop equipment and production plan. Inspection and test program. Service record research plant, etc.

The classification proposed includes distinguishing between airworthy and suitably equipped and safeguarded airplanes and those judged unworthy or hazardous from an insurance point of view; also a classification of the airworthy devices as to service limitations, radius of operations, speed, ceiling limit, useful load, landing speed, etc.

For the present at least all work with regard to aviation will be located at the main plant in Chicago. Presumably from twelve to eighteen months will elapse before the plan is in full and active operation.

Insurance Men Demand Aerial Laws

At a meeting of the National Aircraft Underwriters' Association held November 30 at 140 Nassau St., New York, a report was presented by Edmund Ely, president and chairman of the executive committee, of the association, strongly urging the immediate enactment by the new Congress of federal laws regulating aerial transport. The Association, the Manufacturers Aircraft Association and the Aero Club of America are urging the necessity of adequate aerial laws. Mr. Ely said:

"A potent influence towards stabilizing and safe-guarding flying will be the enactment of suitable federal legislation and the provision of adequate machinery to secure its enforcement, so that the rights and duties of aircraft will be laid down. Granting that proper insurance protection is essential to successful and widespread commercial operation of aircraft it should be borne in mind that the passenger-carrying ship in times of peace is the potential bomber in times of war. In the face of intensive cultivation of the art of flying abroad, it is the plainest common-sense as well as the patriotic duty for the insurance interests to devote such time and thought to the subject as will enable us to assist in the establishment of equal standards here. Consideration of commerce national pride, and national safety urge us to give all possible furtherance to flying development in this country, and we solicit the continued and wholehearted support of our membership and the entire insurance fraternity."

The following officers were elected for the year: President, Edmund Ely of the Automobile Insurance Co.; vice-president, E. S. Martin of the Home Insurance Co.; secy., E. H. Payne of the National Liberty Insurance Co.; treasurer, J. D. Lester of the Globe and Rutgers Insurance Co.; asst. secy., R. J. Smith of the National Aircraft Underwriters' Assn.

Aviation and the Motor Boat Show

Two of the best known aeronautical engine manufacturers in this country were exhibitors at the sixteenth annual Motor Boat Show held at Grand Central Palace December 10 to 18. The Aeromarine Plane and Motor Co. had a speed boat and a very interesting marine engine on exhibition. The engine is known as the Model C Port-Piston-Marine Engine and takes its name from the fact the valve gear consists of an auxiliary piston with ports which operates in a somewhat similar manner as the sleeve valve engines.

The other aeronautical engine manufacturer was the Hall-Scott Motor Car Co. The firm had on exhibition an L-6 airplane engine, and examples of the LM-6 and LM-4 marine engines. These marine engines are very similar to the aviation engines in many respects, and demonstrate the value of experience in building airplane engines particularly in eliminating weight by the use of special alloys.

Another exhibit was the Smith Marine Liberty-12 that was used in the recent Harmsworth Cup races. The principal modifications are those necessary to the fitting of a fly wheel and gears.

Titanine Inc., Establishing Agencies

An indication of the demand for aviation material is the news that Titanine, Inc., of Union, N. J., aircraft dope manufacturers, are increasing their production facilities and expect to have agencies established throughout the United States and Canada by next spring. E. G. Davis, manager of Titanine, Inc., recently informed AVIATION that the Post Office Air Mail Service has approved their Standard dope and pigmented protective coverings, khaki and grey for use on mail planes, and is consuming considerable quantities. Also that their pigmented dopes were authorized by the Army Air Service for general use under date of October 15. Naval Aviation, Bureau of Construction and Repair, have also passed their dope for use on Naval aircraft, Mr. Davis states.

Anti-Dumping Injunction Granted

No legal decision recently has been of such interest and importance to the aeronautical industry in the United States as that of December 6 rendered by Judge Mayer in the Federal District Court of New York, restraining Handley Page, Ltd., the Aircraft Disposal Co., Ltd., and William H. Workman, from disposing of aircraft planes, engines and materials. The decision came as the result of a legal action recently instituted by the Wright Aeronautical Corp., owners of the Wright patents, against the foregoing defendants. The temporary injunction granted by the court has the effect of protecting the American aeronautical industry from the "dumping" here of vast aeronautical stores owned by the British government at the close of the war and which are now said to be obsolete.

In his decision Judge Mayer said that the Aircraft Disposal Co., was formed in March, 1920, and a month later purchased from the British government some 10,000 airplanes and 40,000 aeronautical engines that were surplus material from the British war effort. He also said that there was no market for the material in any part of the world other than the possible market that might be made in this country.

He also recited the fact that a hearing was held in Washington on May 28, 1920 by the House Ways and Means Committee in connection with a bill designed to prevent dumping of this material. Brig.-Gen. William Mitchell, of the United States Air Service at that time declared the importation of these planes would ruin the American aeronautical industry.

"The defendants acquired these planes from the British government with their eyes open" continues the decision, "and took their chances of their legal rights. They state they have selected 2,365 planes for the American market, the selling price of these planes is said to be $6,500,000 and the defendants assert that the expense of storage and other incidentals are mounting high, and if a preliminary injunction goes against them they lose the market and thus suffer great loss. Yet, this was their hazard. They should have known that the plaintiff would move expeditiously and diligently as it has. There are then no equities in favor of the defendants, and they must rely on their legal rights."

F. B. Rentschler, vice-president and general manager of the Wright company said that the decision has given general satisfaction to the entire aeronatical industry in America, inasmuch as the builders here of planes and engines felt that it meant unfair competition on the part of foreign airplane corporations and that the home industry would be greatly hindered if not altogether stopped.

"In attempting to enforce its rights under the Wright patents the Wright Aeronautical Corp. felt that it was doing a duty to the entire industry in the United States", he explained. "The British government had on hand at the close of the war thousands of planes and engines which are now obsolete and which they wished to dump into the United States at prices not commensurate with the actual cost of production. The U. S. Army Air Service attempted to aid the industry by getting an anti-dumping measure through Congress at its last session to prevent the sale of these planes and materials but it was held up by other legislation.

"It is to be hoped that it will be passed at this session and it probably will be, but in the meantime we all feel that Judge Mayer's decision will act as a barrier to save us from unfair competition. Of course, we hope that the injunction will be made permanent but at the present time we are unable to say when the matter will come up for final decision.

"There is one thing which each American manufacturer wishes to make clear: We do not want to stifle fair competition, but we do want our market freed from the sale of planes, engines and parts which are obsolete and which are of war-time production."

In conclusion Mr. Rentschler said, "It must be remembered that this dumping process, if permitted to continue in America, will be an annual performance on the part of foreign governments and plane and engine builders. Each year as aircraft, engines and materials become obsolete, they will be sent to the American market unless appropriate action is taken to protect our industry. It can be readily seen what an effect this will have upon the national defense in the air, for both the Army and Navy are looking to the American industry to keep not only abreast of modern aircraft development but ahead of the program of other countries.

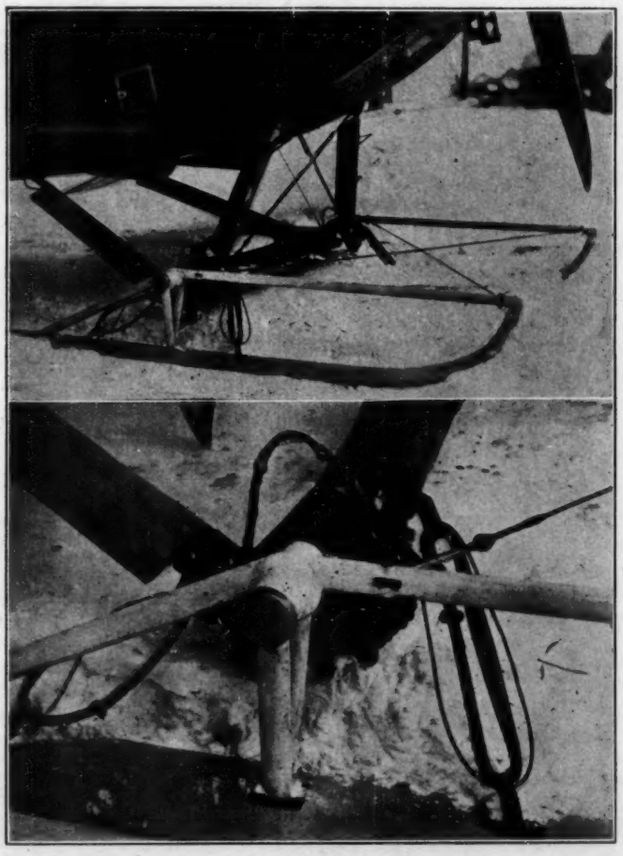
British Airship Crew Gets U. S. Navy Cross

The Secretary of the U. S. Navy has approved a recommendation to award the Navy Cross to the members of the British airship R-34, which made her memorable flight across the Atlantic Ocean in July, 1919, under command of Major G. H. Scott, of the British army. It was the first flight made across the Atlantic from East to West; it was the first aerial round trip over the Atlantic; and it was the first dirigible to make the voyage between America and Europe. Lieut. Comdr. Z. Lansdowne, U.S.N., who made the flight with the British crew as relief, altitude and direction pilot, also receives the medal.

New Mexican Air Chief

Rafael A. O'Neill has recently been appointed the Chief of the Mexican National Air Force. He is at present in England obtaining machines for the formation of several squadrons, pursuit, reconnaissance and bombardment. Also he will obtain the necessary apparatus for repairs, etc. in order to equip the forces in the field and at the flying school.

Rafael Ponce de Leon has been appointed the Chief of Staff of the Air Force. His assistants are the Pilot Officers Alfonso Virgen, Rafael Montero, Samuel C. Rojas, Guillermo Ponce de Leon and Ascencio Jimenez.



An Austrian Snow-Skid

An Aerial Traveling Salesman

Present marketing conditions prove that selling campaigns must be put on with more punch and force, and to get payable results new angles are required in the sales talks. To this end William W. Hosp, veteran flier and experienced on internal combustion engines and all products associated with them, has founded a service that is called "The Aerial Tramp Service" for the purpose of business building, exploitation and sales promotion from a new angle.

This service only handles such products as can be associated with aviation. At first this would seem limited, but if one stops to realize that this includes ignition devices, instruments, oil, gas, etc., they can readily determine the large scope of operation which can be undertaken in this line. He has accomplished very good results so far, which he claims is all due to the reception he receives from the dealers and customers because of their willingness to accede that if this device works well on an airplane, it must function well on an automobile.

W. W. Hosp

Territory outside of New York will be covered in the Spring by airplane. This method will not only save time and give practical demonstration of the device in operation on the airplane, but will also make the impression that will enable the salesman to bring back the dealer's order.

A considerable number of pilots have at various times used airplanes for advertising, and among the advertising men it is doubtful whether the use of an airplane is very valuable as an advertising medium alone. However, Mr. Hosp has proven without doubt, that if the plane is coupled with business exploitation, all the advertising value that is in a plane can be worked out with immediate results.

Omaha to Chicago in 165 Minutes

J. T. Christensen, air mail pilot, flew the eastbound mail from Omaha to Chicago December 14 in 2 hrs. and 45 min. The 440 miles were covered at an average speed of 162 m.p.h. which is the fastest time an air mail pilot ever has made over that distance.

It was 10:40 o'clock when the mechanics made fast the covering on the mail compartment of the DeHaviland ship which had more than 400 pounds of letters aboard.

At 10:42 Christensen took off before a strong wind. At 12:15 p. m. he landed at the "half way station" in Iowa City. A short wait, a puff at a cigarette, a bit to eat, and he took off again. At 1:57 p. m. the ship roared over the hangars at Maywood and landed.

"That's knocking off the miles!" said Eugene W. Majors, manager of the field.

Christensen is the pilot who carried the east bound mail from Chicago to New York in 5 hours and 31 minutes on Dec. 3. His flight that day from Cleveland to New York, made at an average of 151 miles an hour, stood as the mail service record until he broke it himself.

An Engine Compartment Fire Extinguisher

Capt. W. A. Ross of War-Inc. of Washington, D. C., demonstrated his firefighting apparatus for airplanes in the showrooms of Walter T. Varney recently. He set an engine on fire and in six seconds the fire was out. He uses a system of sprinklers using carbon tetrachloride. As soon as fire breaks out the pilot opens a valve and between the V in the engine and on both sides this chemical pours out so that the fire is quickly extinguished. Walter Varney has secured rights to install the system on his ships.

Air Service Officers for General Staff

The initial General Staff eligible list has been published and contains the names of several well known Air Service officers among whom are:

Regular Army Officers—Maj.-Gen C. T. Menoher, Brig.-Gen. William Mitchell and Major F. P. Lahm.

Civilians—Col. Robert L. Montgomery, Lieut.-Col. Benjamin F. Castle, Lieut.-Col. John R. Maulthrop.

This initial list was selected by a board which under the law consisted of the General of the Army, the commandant of the General Staff College, the commandant of the General Service Schools, and two other general officers selected by the Secretary of War, who were not then members of the General Staff Corps.

The law states that "after the completion of the initial General Staff Corps eligible list, the name of no officer shall be added thereto unless upon graduation from the General Staff School he is specifically recommended as qualified for General Staff duty, and hereafter no officer of the General Staff Corps except the Chief of Staff shall be assigned as a member of the War Department General Staff unless he is a graduate of the General Staff College or his name is borne on the initial eligible list."

As the policy of the War Department is stated to be that general officers shall hereafter be selected from among the officers on the General Staff eligible list who have served on the War Department General Staff, it may be of interest to the officers of the Service to note omissions on the initial list. Many officers of brilliant record may, however, in future be assigned to the War Department General Staff under the provision as to further qualifications for General Staff duty.

Aero Club of Cincinnati Elects Officers

The Aero Club of Cincinnati held its second annual meeting on December 2 at the Metrepole Hotel. It was well attended and was preceeded by a dinner at which Col. Peter E. Traub, Commandant of Fort Thomas was guest of honor. Col. Traub and Miller Outcalt related various thrilling overseas experiences in which the Air Service played a great part. The coming of the air mail to this city was discussed by a member of the Aviation Committee of the Cincinnati Chamber of Commerce. The dinner and social events were followed by a business meeting and the following officers were elected for the year of 1921: John H. Stewart, president. Cornelius Hauck, first vice-president, Mark Campbell, second vice-president, John M. Renner, treasurer, John E. Hendrizson, secretary, L. B. Cahill, Jr., Fred Macklin, Baylo Richardson and N. W. Landmead, directors.

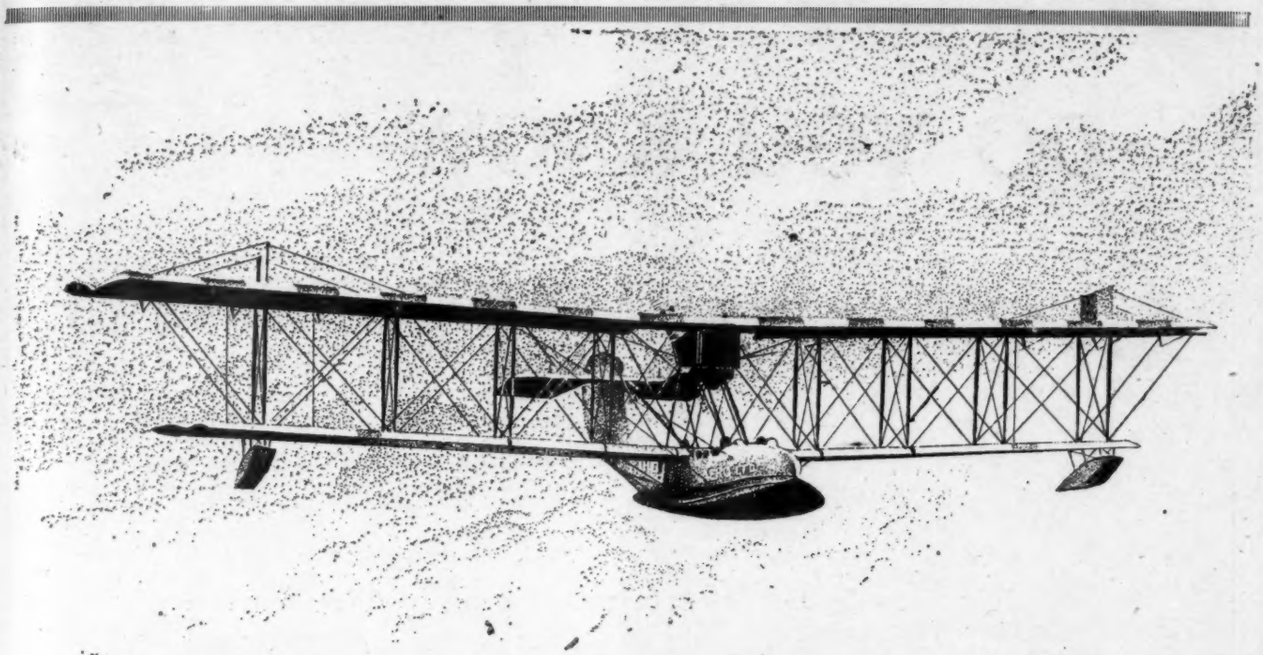
Naval Reserve Flying Corps Transfers

The Navy Department views with satisfaction the fact that 273 officers of the Naval Reserve Fying Corps have made application for transfer to the line of the Navy. While it is hoped that the applications will eventually approximate the 500 authorized in the act of June 4, 1920, the opinion is expressed that those who qualify at the examinations in May, 1921, will supply an efficient nucleus for the Flying Corps which it is thought likely that Congress will authorize by legislation at the present session. The applicants by grades, are as follows: Active, 48 lieutenants, 125 lieutenants (j.g.), 53 ensigns; inactive, 3 lieutenants, 15 lieutenants (j.g.), and 29 ensigns. To date the applications for transfer to the line comprise 1,380 temporary officers, 297 active Reserve officers and 335 inactive Reserve officers; total, 2,012.

Fast Flight on Pacific Coast

All records for airplane flights between San Francisco and Los Angeles were broken November 28, according to Los Angeles aviators, when Lieut. E. C. Batten, an army flier, made the trip in three hours and one minute.

The record time for the flight of 341 miles, air line, was three hours and forty-five minutes, until last Wednesday, when Lieut. L. W. Miller, also an army aviator, made the trip in three hours and twenty-five minutes.



Upper photograph—Booking passage to Albany via "Aero Limited" at Main Booking Office, Hotel Waldorf Astoria, New York.

Lower photograph—Close-up of cock-pit of one of the "Aero Limited" flying-boats.

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